

I claim:

1. A method for stimulating an immune response, comprising administering to a lymphoid tissue a nucleic acid molecule comprising an expression element operationally linked to a nucleic acid sequence encoding one or more heterologous epitopes.

2. The method of claim 1, wherein said lymphoid tissue is selected from the group consisting of spleen, lymph nodes, mucosa-associated lymphoid tissue (MALT), tonsils, Payer's patches, nasal-associated lymphoid tissue (NALT), Waldeyer's ring, and urogenital lymphoid tissue.

3. The method of claim 1, wherein said expression element comprises a hematopoietic cell expression element.

4. The method of claim 3, wherein said expression element functions in a cell selected from the group consisting of B cell, T cell, and dendritic cell.

5. The method of claim 1, wherein said epitope stimulates an antibody response.

6. The method of claim 1, wherein said epitope stimulates a CD4 T cell response.

7. The method of claim 1, wherein said epitope stimulates a CD8 T cell response.

8. The method of claim 1, wherein said epitope stimulates a CD4 T cell response and a CD8 T cell response.

9. The method of claim 1, wherein one of said epitopes stimulates an antibody response and one or more second epitopes stimulates a CD4 T cell response and a CD8 T cell response.

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10. The method of claim 1, wherein said epitope is expressed as a fusion with a cytokine.

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11. The method of claim 10, wherein said cytokine is selected from the group consisting of granulocyte-macrophage colony-stimulating factor, interleukin-2, interleukin-4, interferon- γ , interleukin-5, interleukin-6, interleukin-10 and interleukin-12.

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12. The method of claim 1, wherein said nucleic acid molecule encodes an immunoglobulin molecule containing said heterologous epitope, wherein said epitope is inserted within a complementarity-determining region (CDR) of said immunoglobulin molecule.

13. The method of claim 12, wherein said immunoglobulin comprises a variable region.

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14. The method of claim 13, wherein said variable region is a heavy chain variable region.

15. The method of claim 13, wherein said variable region is a light chain variable region.

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16. The method of claim 12, wherein said immunoglobulin molecule comprises a heavy chain.

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17. The method of claim 12, wherein said immunoglobulin molecule comprises a light chain.

18. A nucleic acid molecule comprising a hematopoietic cell expression element operationally linked to a nucleic acid sequence encoding a heterologous polypeptide.

19. The nucleic acid molecule of claim 18, wherein said expression element functions in a cell selected from the group consisting of B cell, T cell, and dendritic cell.

20. The nucleic acid molecule of claim 18, wherein said nucleic acid sequence encodes a polypeptide expressed as a fusion with a cytokine.

21. The nucleic acid molecule of claim 20, wherein said cytokine is selected from the group consisting of granulocyte-macrophage colony-stimulating factor, interleukin-2, interleukin-4, interferon- γ , interleukin-5, interleukin-6, interleukin-10 and interleukin-12.

22. A nucleic acid molecule comprising a hematopoietic cell expression element operationally linked to a nucleic acid sequence encoding one or more heterologous epitopes, wherein said nucleic acid sequence encodes an immunoglobulin molecule containing said one or more epitopes and wherein said one or more epitopes is inserted within a complementarity-determining region (CDR) of said immunoglobulin molecule.

23. The nucleic acid molecule of claim 22, wherein said immunoglobulin comprises a variable region.

24. The nucleic acid molecule of claim 23, wherein said variable region is a heavy chain variable region.

25. the nucleic acid molecule of claim 23, wherein said variable region is a light chain variable region.

5 26. The nucleic acid molecule of claim 22, wherein said one or more epitopes is inserted in two CDRs.

10 27. The nucleic acid molecule of claim 22, wherein said epitope is expressed as a fusion with a cytokine.

15 28. The nucleic acid molecule of claim 27, wherein said cytokine is selected from the group consisting of granulocyte-macrophage colony-stimulating factor, interleukin-2, interleukin-4, interferon- γ , interleukin-5, interleukin-6, interleukin-10 and interleukin-12.

20 sub c² 29. A method of treating a condition, comprising administering a nucleic acid molecule comprising a hematopoietic cell expression element operationally linked to a nucleic acid sequence encoding a heterologous polypeptide, wherein said nucleic acid
25 molecule is targeted to a hematopoietic cell.

30 30. The method of claim 29, wherein said hematopoietic cell is a B cell.

30 sub c³ 31. The method of claim 29, wherein said hematopoietic cell is targeted *in vivo*.

35 32. The method of claim 29, wherein said hematopoietic cell is targeted *ex vivo*.

33. A method of treating a condition, comprising administering a nucleic acid molecule

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1. The first part of the report, "Introduction", discusses the importance of the study and the objectives of the research. It also provides a brief overview of the methodology used in the study.